

FILTER STRIP

(Acres)
Code 393

Natural Resources Conservation Service
Conservation Practice Standard

I. Definition

A strip or area of herbaceous vegetation situated between cropland, grazing land, or disturbed land (including forest land) and environmentally sensitive areas.

II. Purposes

The purposes of this practice are the following: (a) to protect water quality by filtering and removing sediment, organic matter, pesticides, sediment-borne phosphorus and other pollutants from *sheet flow*¹ runoff and subsurface flow through deposition, absorption, plant uptake, denitrification or other processes; (b) to eliminate row crop production and associated pollutants adjacent to environmentally sensitive areas; and (c) to protect and stabilize the riparian zone and reduce flood water velocity.

III. Conditions Where Practice Applies

This practice applies to areas where conditions associated with sediment and pollutant delivery from the contributing drainage area are identified and where the installation of this practice, as part of a conservation management system, will provide a direct benefit to water quality and/or riparian stability.

Environmentally sensitive areas may include, but are not limited to: perennial streams, intermittent streams, drainage ditches, sinkholes, crevices, springs, ponds, wetlands, lakes, or impoundments associated with riparian areas.

This practice does not apply to the treatment of conditions where high levels of pollutants can be anticipated such as animal feed lots, feed storage areas, and milking center waste areas. For these types of situations refer to Natural Resources Conservation Service (NRCS) Field Office Technical Guide Section IV (FOTG), Standard 635, Wastewater Treatment Strip. This practice does not apply where soil loss is above “T” within 300 feet of the filter

strip. This practice does not apply where the creation, restoration, or enhancement of wildlife habitat or movement corridors is the primary purpose. Refer to FOTG Standards 645, Wildlife Upland Habitat Management; 391, Riparian Forest Buffer, and other appropriate standards.

IV. Federal, State and Local Laws

Installation and maintenance of filter strips shall comply with all federal, state and local laws, rules or regulations. The operator is responsible for securing required permits. This standard does not contain text of any federal, state or local laws.

V. Criteria

A. Establishment

1. Areas of *concentrated flow* in the contributing drainage area and through the filter strip shall be evaluated and treated.
2. Filter strips shall be established by one of the following: 1) planting a seed mix in accordance with criteria specified in FOTG Standard 342, Critical Area Planting, Section V.C.5. (Seeding); 2) managing an existing grassed area in accordance with the operation and maintenance plan; or 3) modifying predominantly grassed areas by sapling and shrub control. Modification shall not occur in well established tree and shrub corridors.
3. Where removal of dissolved nitrogen is a primary consideration, at least 50% of the species shall be deep-rooted. Warm-season species are considered to be deep-rooted. Refer to Table 6 in FOTG Standard 342, Critical Area Planting for deep-rooted introduced species. A nutrient management plan must be followed.

¹Words in the standard that are shown in italics are described in X. Definitions. The words are italicized the first time they are used in the text.

4. Reed canary grass (*Phalaris arundinacea*), Kentucky bluegrass (*Poa pratensis*), Creeping red fescue (*Festuca rubra*), Chewings red fescue (*Festuca rubra* ssp. *falax*), or other *invasive plants* shall not be included in any seed mix.
 5. State listed *noxious weeds* and invasive plants shall be *controlled* during establishment, if present.
 6. Mowing of cool season grasses during the establishment year shall be as required to control weeds.
 7. Mowing of prairie plantings during the establishment year to control weeds shall be to a height of not less than 6 inches to prevent maturation of weed seeds. More rigorous mowing may be needed in the second and third years to control weeds in warm season grass plantings.
 8. Once vegetation has been established, the filter strip shall not be mowed except as outlined in Section VIII, Operation and Maintenance.
- B. Minimum filter strip widths shall adhere to Table 1. The starting point for measuring minimum filter strip widths for the following landscape features shall be as follows:
1. Lakes - Filter strips shall be measured from the *ordinary high water mark (OHWM)*. If the slope exceeds 12% at the OHWM, the filter strip shall be measured at the point at which slopes are 12% or less. See Figures 1 and 2.
 2. Perennial and intermittent streams, springs, and drainage ditches - Filter strips shall be measured from the top of bank or OHWM, if it has been determined. If the slope exceeds 12% at the top of bank, the filter strip shall be measured at the point at which slopes are 12% or less. If banks are not apparent, measurement shall start 10 feet from the center of the channel. Each side of the stream shall be evaluated independently. See Figures 1 and 2.
 3. Wetlands - Filter strips shall be measured from the upland-wetland interface. See Figure 3.
 4. Sinkholes, crevices and internally drained areas- Filter strips shall be measured from the edge of the feature.
 5. Existing tree and shrub corridors - Filter strips shall be measured from the upgradient edge of the wooded corridor. See Figure 4.
- C. The minimum established filter strip width shall be met over 95% of the filter strip length. In no case shall the filter strip width be reduced to less than 20 feet. The minimum filter strip width shall not be reduced where slopes greater than 6% are within 300 feet of, and draining to, the design area. See Figure 5.
- D. When soil disturbance is necessary due to streambank or gully repair, the appropriate action shall be taken to limit the disturbance and protect and revegetate all disturbed areas.
- E. The filter strip shall be located along the downslope edge of a field or disturbed area. To the extent practical it shall be placed on the contour.
- F. Grazing shall not be permitted in the filter strip except as in section VIII.D.1.
- G. Areas below the ordinary high water mark shall not be disturbed. This does not preclude practices intended for bank stabilization.
- H. Land below the downgradient edge of the filter strip shall be maintained in vegetative cover adequate to maintain stability and prevent erosion. See Figures 1 and 2.
- ## VI. Considerations
- Additional recommendations relating to design which may enhance the use of, or avoid problems with, this practice, but are not required to ensure its basic conservation function are as follows:
- A. Consider conceptual filter strip applications shown in Figure 6.
 - B. Consider ecological factors such as maximizing benefits for wildlife and habitat.
 - C. Filter strips should be strategically located, particularly in the upper reaches of the watershed, to reduce runoff, and increase

infiltration and ground water recharge throughout the watershed.

- D. Consider using this practice to enhance the conservation of declining species of wildlife, including those that are threatened or endangered.
- E. Consider using this practice to protect National Register listed or eligible (significant) archaeological and traditional cultural properties from potential damaging contaminants.
- F. Consider marking filter strip boundaries in an identifiable manner to prevent encroachment.
- G. Consider locations of vehicle and/or livestock crossings. Refer to FOTG Standard 560, Access Road.

VII. Plans and Specifications

Plans and specifications for the filter strip shall be in keeping with this standard. Based on this standard, plans and specifications shall be prepared for each specific field site where a filter strip will be installed. A plan includes information about the location, construction sequence, vegetation establishment, operation and maintenance requirements.

Plan specifications will include:

- A. Dimensions and slope of the filter strip to accomplish the planned purpose.
- B. Species selection and planting rates to accomplish the planned purpose.
- C. Planting dates, care, and handling of the seed to ensure that planted materials have an acceptable rate of survival.
- D. Site preparation sufficient to establish and grow selected species.
- E. Identification and treatment of concentrated flow areas.

VIII. Operation and Maintenance

- A. Cool season grasses: Mowing shall be done as needed to reduce the competition from woody vegetation and maintain vigorous sod.

- B. Warm season grasses: Mowing shall be done only as needed to reduce the competition from woody vegetation, generally no more than once every three years. Grasses shall not be mowed shorter than 6 inches.
- C. Mowing shall occur from August 1 to September 1. After mowing, the cut vegetation shall be removed if dense enough to impede regrowth. Removal is recommended to encourage dense growth, maintain an upright growth habit, and remove nutrients contained in the plant tissue.
- D. Control of noxious weeds, invasive plants and woody vegetation:
 - 1. Grazing or herbicide may be used after submission and approval of a plan by the administering office.
 - 2. Prescribed burning may be used to manage and maintain the filter strip. A burn plan must be developed and submitted to the appropriate administering agency for approval.
- E. Avoid damage to filter strip vegetation from herbicide application to nearby fields.
- F. State listed noxious weeds shall be controlled. Control of non-native invasive plants is encouraged.
- G. Inspect the filter strip after storm events and repair any gullies that have formed, remove unevenly deposited sediment accumulation that will disrupt sheet flow, reseed disturbed areas, and take other measures to prevent concentrated flow through the filter strip.
- H. To maintain or restore the filter strip's function, periodically regrade the filter strip area when sediment deposition at the filter strip-field interface jeopardizes its function, and then reestablish the filter strip vegetation, if needed.
- I. Vehicular traffic shall be excluded except as necessary for establishment and maintenance activities.

IX. References

Castelle, A. J., A. W. Johnson, and C Conolly. 1994. Wetland and stream buffer size requirements - a review. Environ. Qual. 23:878-882.

Cooper, J. R., J. W. Gilliam, R. B. Daniels, and W. P. Robarge. 1987. Riparian areas as filters for agricultural sediment. *Soil Sci. Soc. Am. J.* 51 (2): 416-420.

Daniels, R. B., and J. W. Gilliam. 1996. Sediment and chemical load reduction by grass and riparian filters. *Soil Sci. Soc. Am. J.* 60 (1): 246-251.

Desbonnet, A., P. Pouge, V. Lee, and N. Wolff. 1994. Vegetated buffers in the coastal zone: A summary review and bibliography. Coastal Res. Center, Rhode Island Sea Grant, Univ. of Rhode Island.

Dillaha, T.A., J.H. Sherrard, and D. Lee. 1989. Long-term Effectiveness of Vegetative Filter Strips. *Water Environment and Technology*, 1:419-421.

Johnson, A. W., and D. M. Ryba. 1992. A Literature Review of Recommended Buffer Widths to Maintain Various Functions of Stream Riparian Areas. King County Surface Water Management Division, Washington.

Smith, M. 1992. Vegetative filter strips for improved water quality. Iowa St. Univ. Pub. Pm-1507. Ames, IA.

United States Department of Agriculture - Natural Resources Conservation Service. 1995. Wisconsin Field Office Technical Guide, Section II C: Cropland Interpretations, "Erosion Factors and Soil Groups Table".

United States Department of Agriculture – Natural Resources Conservation Service, Wisconsin Field Office Technical Guide, Section IV (Technical Standards).

University of Wisconsin Cooperative Extension Service. Field Crops Pest Management Guide in Wisconsin. UWEX-A3646.

Wenger, S. 1999. A Review of the Scientific Literature on Riparian Buffer Width, Extent, and Vegetation. Office of Public Service and Outreach, Institute of Ecology, University of Georgia.

Wisconsin Department of Natural Resources. Home on the Range, Restoring and Maintaining Grasslands for Wildlife. PUBL-WM-228 (Madison, WI : Bureau of Wildlife Management).

Wisconsin Department of Natural Resources. The Wealth of Waterways, Managing Stream Corridors for Wildlife. PUBL-WM-225 (Madison, WI : Bureau of Wildlife Management).

Wisconsin Department of Natural Resources. 1997. Wisconsin Manual of Control Recommendations for Ecologically Invasive Plants. Madison, WI: Bureau of Endangered Resources.

Wolkowski, R. P. 1996. Soil Conservation Practices For Runoff Prevention. New Horizons in Soil Science, University of Wisconsin-Madison, Number 3.

X. Definitions

Concentrated flow (V.A.1.) – Where runoff water collects and flows in defined depressional water courses that begin where overland flow, including rill, converge.

Control (VIII.E.) – To destroy the aboveground portion of a noxious weed in a manner and at the proper time to prevent the development and distribution of viable seeds or other propagules and their spread from one area to another. For species which reproduce vegetatively, control includes the use of methods which help contain or reduce the vegetative spread of the weed.

Hydrologic soil group (Table 1) – See NRCS FOTG Section II, Cropland Interpretations.

Invasive plants (V.A.4.) – Having the ability to significantly displace desirable vegetation in landscapes or to reduce yield of growing crops.

Noxious weed (V.A.4.) – An aquatic or terrestrial herbaceous or woody plant that is legally designated as being invasive and persistent, and is injurious to human values, such as public health, the environment, livestock, growing crops, natural areas or other lands.

Ordinary high water mark (V.B.1.) - The ordinary high-water mark (OHWM) is the point on the bank or shore where the water is present often enough so that the lake or stream bed begins to look different from the upland. Specifically, the OHWM is the point on the bank or shore up to which the water, by its presence, wave action or flow, leaves a distinct mark on the shore or bank. The mark may be indicated by erosion, destruction of or change in vegetation or other easily-recognizable characteristics.

The OHWM can be located through on-site studies of physical and biological conditions at the shoreline. The principal indicator is the change from water plants to land plants. In the area where the plants change, the investigator may also use indicators such as change in soil type, ridges or other erosion marks or water stains on rocks, soils, trees or structures. If none of these indicators are available in the immediate location, the elevation of the OHWM may be found at another spot and transferred to that site in question.

Sheet flow (overland flow) (II.) – Sheet flow is flow over plane surfaces, where runoff water flows in a thin uniform sheet across the land before it collects in a concentrated flow. After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow.

“T” (III.) – Soil loss tolerance. It is the average annual erosion rate that can occur with little or no long-term degradation of the soil resource on the field. Soil loss tolerance values are assigned to each soil map unit.

Table 1
Rating Sheet for Determining Minimum Filter Strip Width¹

Direct Contributing Factors	Factor Points
1. Hydrologic Soil Group ²	
A	0
B	10
C	20
D	20
2. Predominant slope within 100 feet of the low edge of the filter strip ³	
0-1%	0
>1-3%	5
>3-6%	15
>6-12%	30
3. Predominant slope from 100-300 feet from the low edge of the filter strip ³	
0-1%	0
>1-3%	5
>3-6%	10
>6-12%	15
>12%	20

¹ Soil loss must be at T or less for the adjacent land for a distance of 300 feet. (See Section III.)

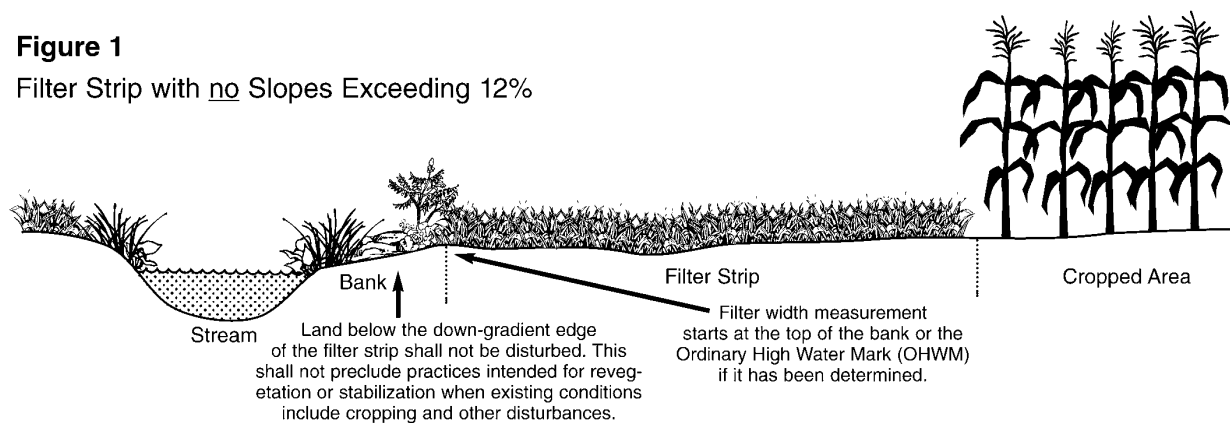
² NRCS Field Office Technical Guide Section II, Cropland Interpretations.

³ Starting point for measurement shall be as described in section V.B.1-5.

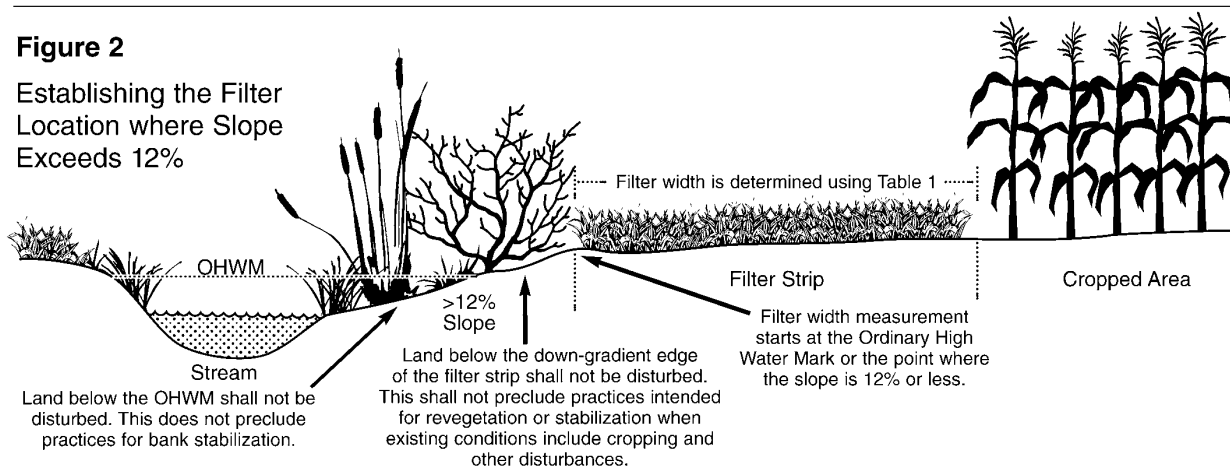
Total Point Range	Minimum Filter Strip Width for Sediment Trapping	Minimum Filter Strip Width for Dissolved N ⁴ /Sediment
0-10	20 feet	70 feet
15-20	30 feet	70 feet
25-30	40 feet	70 feet
35	50 feet	80 feet
40	60 feet	80 feet
45	70 feet	90 feet
50	80 feet	100 feet
>50	100 feet	120 feet

⁴ Where dissolved nitrogen is a concern, soil loss must be at T or less for the adjacent land for a distance of 300 ft and a nutrient plan must be in place. (See Section V.A.3.)

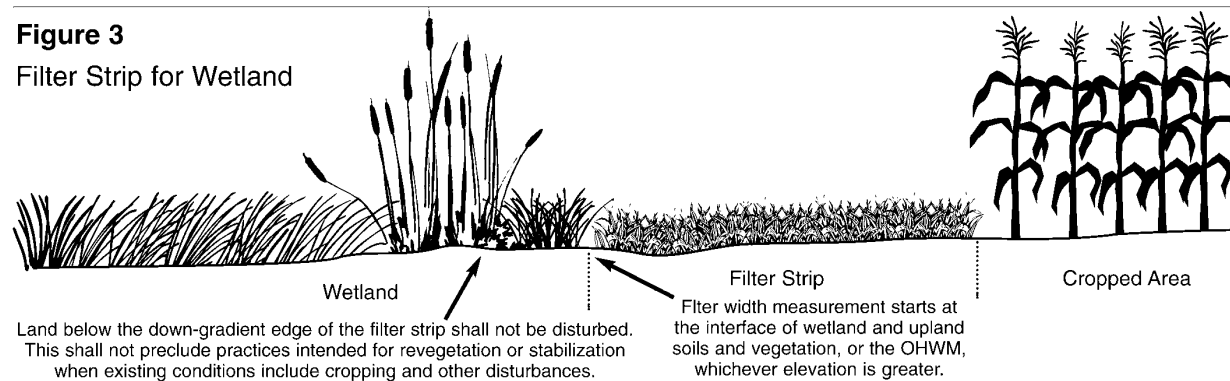
Note: Minimum widths for other pollutants may be greater, and must be designed on a case-by-case basis.

Figure 1Filter Strip with no Slopes Exceeding 12%**Figure 2**

Establishing the Filter Location where Slope Exceeds 12%

**Figure 3**

Filter Strip for Wetland

**Figure 4**

Existing Woody Vegetation

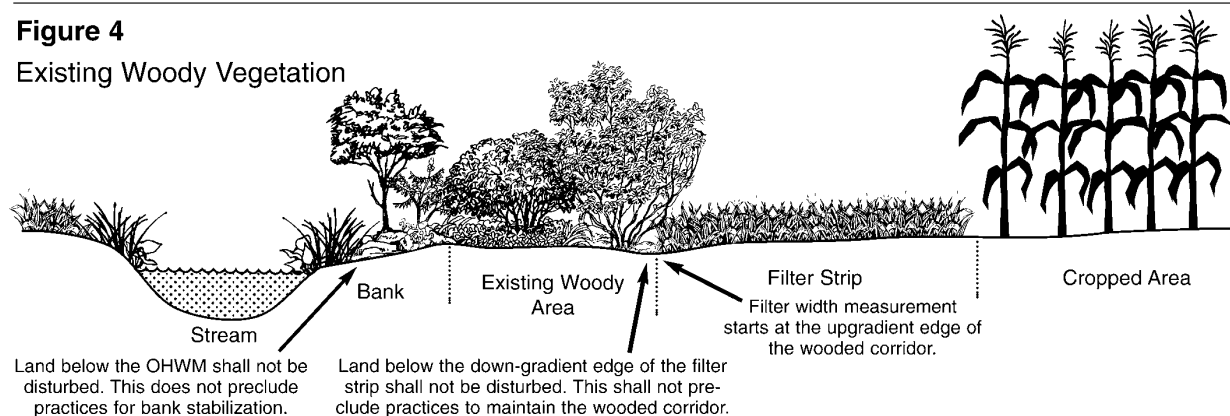


Figure 5
Filter Strip Minimum Width

In this example, the design minimum filter strip width is 30'.
 In no case shall filter strip width be reduced to less than 20'.

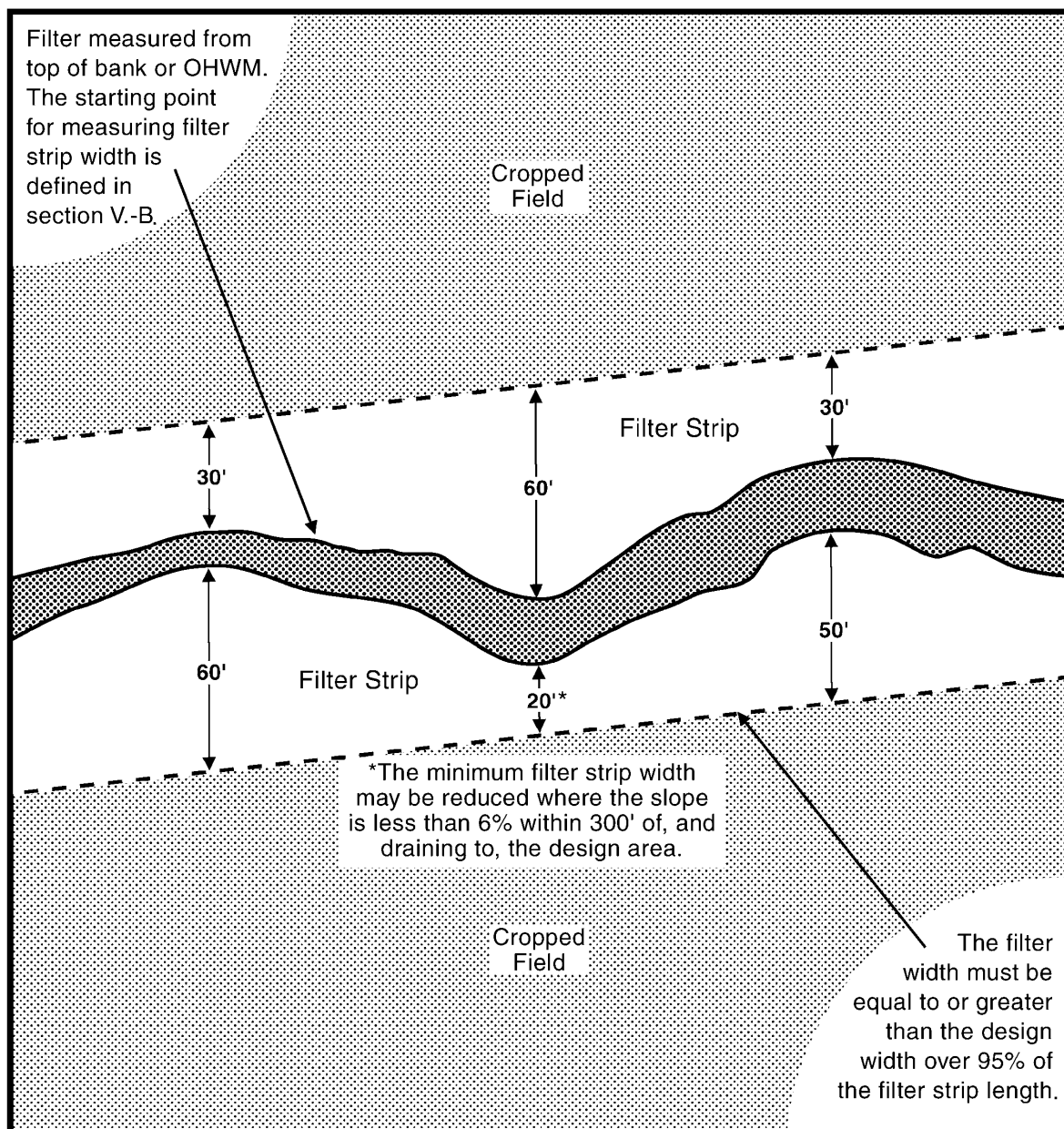


Figure 6
Conceptual
Riparian Buffer Applications

White areas indicate filter strips.

